

1
2 POWERED CUTTING SURFACE WITH PROTECTIVE GUARD FOR
3 EQUINE TEETH

4 **BACKGROUND OF THE INVENTION**

5 FIELD OF THE INVENTION

6 This invention relates to the art of tooth maintenance for
7 large animals and more particularly to a set of tools which may be used
8 under powered motion for care and maintenance such as removing a
9 selected portion of the exposed surface of teeth, such as equine teeth,
10 with the powered hand being guided into the mouth of the horse. The
11 powered tool is partially guarded so as to protect fleshy portions of the
12 horse's mouth from being engaged by the powered tool. The tool may
13 have a rotary cutting surface of a selected size and shape, sometimes
14 commonly called a burr, or the tool may be a rotary cut-off disk. The
15 selected tool, either the burr or cut-off disk, is supported and partially
16 enclosed in a protective guard formed as a hand piece that may be
17 guided into the mouth of a horse to perform care and maintenance on a
18 selected portion of the teeth. The hand piece fabricated according to the
19 teaching of this invention provides for quick on and off attachment of a
20 selected cutting surface for maintenance of a preselected portion of teeth
21 within the same hand piece or another hand piece sized to ease access to
22 the next selected portion of the horse's mouth. The selected cutting
23 surface is mounted within the protective guard/hand piece arrangement
24 that may further incorporate a vacuum channel whereby the tooth dust
25 and debris created by the powered cutting surface removing a portion of
26 tooth is sucked out of the mouth of the horse. The motion of the tooth
27 surface removal tool may be changed from rotary to powered
28 reciprocating motion for a selected portion of the teeth. Attaching the
29 powered drive to the rotary cutting surface by means of an adjustable

1 clutch further enhances protection from injury to the inside of the
2 mouth of the horse.

3 DESCRIPTION OF THE PRIOR ART

4 Throughout the life of the horse, the teeth continue to
5 extend from the gums. When non-domesticated horses graze on the
6 ground, they pick up sand and hard particles in the grass, which would
7 naturally reduce the growth of the horse's teeth.

8 In order for domesticated horses to properly chew their food,
9 which consists mostly of preprocessed grain and formula, the teeth
10 require periodic maintenance. Without the natural wearing of the teeth
11 from grazing on the ground, the teeth may grow uneven and too long,
12 thus interfering with normal eating.

13 In the past, regular dental care to remove points, hooks or
14 ridges that have grown or worn into the teeth required the use of a
15 specially designed rasp-like tool to remove them, a process called floating
16 the teeth. Because of the structure of the teeth, the horse does not have
17 nerves extending upward in the teeth and therefore feels no pain when
18 the teeth are filed to reshape them.

19 A grown horse uses 36 teeth to eat. The 6 upper incisors
20 and the 6 lower incisors are for shearing grass and leaves, which are
21 masticated by 12 premolars, and 12 molars located on both sides of the
22 upper and lower jaws. These molars must align for the horse to chew
23 properly.

24 The majority of dental problems are associated with the
25 molars and premolars. However, if the incisors are too long, opposing
26 molars and premolars may be prevented from engaging properly.

27 In the prior art, hand tools similar to metal files or rasps
28 were used to remove a selected portion of the tooth surface. These tools
29 consisted of several shaped handles with pads mounted on one end.
30 The pads accepted plates having an abrasive or specially designed file or

1 rasp-toothed surface selected by the user. The mounted abrasive or
2 rasp on the handle was then inserted into the horse's mouth and
3 positioned against the tooth structure that needed to be altered. The
4 user then manually applied pressure and movement to the handle until
5 the selected portion of the tooth structure was removed.

6 Some prior solutions to the problem were to add motor
7 power to the burrs to provide a "power dental tool" to replace the manual
8 rasps. These solutions ease the manual work but introduced other
9 problems such as the uncontrolled creation of dust and debris as well as
10 the danger of injury to the horse and user from exposed high speed
11 reciprocating or rotary burrs or rasps which may engage soft tissue such
12 as the cheek, tongue, or gums inside the horses mouth.

13 Thus, there has long been a need for an arrangement that
14 allows the user, usually a veterinarian, an owner or an equine dentist, to
15 easily perform the removal of preselected material from the exposed
16 surface of the horse's teeth without danger to the horse or the person
17 doing the job.

18 It is desired that the arrangement allow the user to access
19 the full array of teeth with a set of preselected shaped and surfaced files,
20 rasps or other tools such as diamond cut-off blades.

21 It is further desired that the arrangement be motor driven
22 but provide safety to the user and horse.

23 It is further desired to provide preselected shaped covers or
24 guards around selected portions of the rotary tool to allow the system to
25 be used in all parts of the mouth of the horse.

26 It is further desired to provide a clutch between the motor
27 and the rotary tool. The threshold of disengagement of the rotary power
28 applied by means of the clutch may be adjustable with access for
29 adjustment that does not require dismantling the system.

1 It is further desired that the arrangement be able to remove
2 accumulation of debris from the inside of the horse's mouth during the
3 procedure.

4 It is desired that a simple latching or unlatching movement
5 engage and disengage the selected tool within the rotary driven
6 arrangement.

7 It is desired that a simple latching or unlatching movement
8 engage and disengage selected guards around the rotary tool.

9 It is further desired that during the operation of the
10 arrangement for the removal of material from inside the mouth the
11 inadvertent engagement of soft tissue inside the mouth not adversely
12 affect the user or the horse.

13 It is desired that reconfiguration of the arrangement be
14 accomplished even if the users hands are slippery.

15 It is further desired that the motor be separated from the
16 rotary tool by a drive train so that the user need not support the weight
17 of the motor during the procedure.

18 It is further desired that the arrangement be easily adapted
19 to a "power dental tool" motor or handle the user may presently own.

20 SUMMARY OF THE INVENTION

21 Accordingly, it is an object of the present invention to
22 provide an arrangement that allows the user to safely and easily perform
23 a dental procedure of removal of preselected material from the exposed
24 surface of the teeth of horses.

25 It is another object of the present invention to provide an
26 array of preselected size, shape and surfaced tools to be used to remove
27 the tooth material as well as a means for quickly changing the rotary tool
28 selected and provide a guard around a selected portion of the rotary tool
29 so that it does not engage the flesh inside the mouth of the horse.

30 It is an object of the present invention to provide a

1 clutch arrangement which allows the user to initially adjust the
2 threshold at which the rotary motion will disengage should the rotary
3 tool inadvertently entangle flesh inside the mouth of the horse. It is a
4 further object that said threshold may be easily changed as the
5 procedure progresses among various portions of the mouth without
6 dismantling the system.

7 It is another object of the present invention to provide a
8 method of removal of the tooth material debris from inside of mouth of
9 the horse without stopping or interfering with the progress of the
10 procedure.

11 It is yet another object of the present invention to provide an
12 arrangement which does not require the user to support the motor
13 during the procedure.

14 It is yet another object of the present invention to be easily
15 mountable on or at least partially adapted to a "power dental tool" which
16 may be currently owned by the user.

17 The above and other objects of the present invention are
18 achieved, according to a preferred embodiment thereof, by providing a
19 system of an improved power tool arrangement of a motor, power train,
20 tools that remove tooth material, rotary tool hand pieces which support
21 the tools for rotary motion or reciprocating motion and provide a guard
22 to separate the tool from soft tissue. The arrangement is provided with
23 means to easily reconfigure the tool, tool support and guard to adapt the
24 system for powered removal of preselected portions of teeth.

25 MOTOR

26 The power for the preferred arrangement may be supplied
27 from a preselected off the shelf rotary hand tool that may be obtained in
28 various configurations of torque and adjustable rpm under the
29 trademarks DREMEL or SUHNER. Each motor is designed to accept the
30 shaft of a tool with an arrangement of a collet. The tool may have a

1 selected cutting surface and a selected length of shaft. The rotary hand
2 tool may be enhanced with a flexible shaft, one end adaptively
3 mountable on the rotating shaft of the motor and the remote end
4 attachable to an optional handle whereby under the condition of the
5 rotary tool being mounted on the handle, the user may perform work by
6 directing the rotary tool remote from the motor without having to
7 support the weight of the motor. The motor may be supported within a
8 backpack, fannypack or sling arrangement worn by the user.

9 POWER TRAIN

10 The flexible shaft that may be mounted between the motor
11 and the tool removes the burden of holding the motor and physically
12 separates the motor from the tool thereby diminishing the level of sound
13 of the arrangement that may be disturbing to the horse. One end of the
14 flexible shaft may incorporate an adapter for quick push on connection
15 with the selected motor, the end attachable to the hand piece may be
16 fabricated with a stainless steel sleeve and shaped to incorporate a catch
17 engagable with a latch mounted on the hand piece. The length of the
18 flexible shaft may be selected to provide easy movement of the end of the
19 shaft remote from the motor.

20 However, the flexible shaft arrangements provide direct
21 coupling between the motor and the rotary tool. Should the tool engage
22 a portion of the soft flesh inside the mouth of the horse or bind against
23 the surface of the teeth, the rotational energy of this direct connection
24 may cause damage to the horse before the tool can be removed or the
25 power disconnected from the motor. In the present invention an adapter
26 is provided between the motor and the flexible shaft. An adjustable
27 clutch is mounted within the adapter to be accessible to the user to
28 adjust the threshold of torque transmitted between the motor and the
29 flexible shaft of the power train. Should the tool bind, as soon as the
30 selected threshold is exceeded, the movement of the power train is

1 interrupted so that the user may safely disengage the tool or clear the
2 obstruction thereby providing protection to the horse and user of the
3 arrangement.

4 TOOL

5 It is possible to obtain off the shelf tools to which rotary
6 motion is applied. The tool is mountable in the motor and generally
7 consists of a shaft and a working surface mounted on the end of the
8 shaft. The shaft is nominally no longer than 1 to 2 1/2 inches. The
9 working surface is provided in an array of shapes, sizes and surfaces.
10 Some of the preferred shapes include a sphere, cone, cylinder, and
11 combinations such as cylinder topped by a half sphere. These tools may
12 be commonly called a burr. The cutting surface formed in the tool may
13 be a preselected pattern of raised rasp like teeth of a preselected size and
14 shape which removes tooth material without binding, bouncing or filling
15 the rasp like teeth with debris.

16 Another type of rotary tool is the cut-off disk which is a
17 platter about the size of a quarter covered with diamond dust and
18 mounted on a shaft. This disk may be used edge on to cut off a selected
19 portion of a tooth rather than grind off the portion with a burr. The edge
20 of the disk may also be used to score the selected portion of tooth so that
21 portion may be chipped off. The flat surface of the disk may be used as
22 a polishing tool or may be used to round off any sharp edges like a disk
23 sander.

24 If a tool having a working surface is mounted within a collet
25 either on the end of the motor or on the end of the handle attached to
26 the motor or end of a flexible drive shaft and the rotary tool has a shaft
27 length of more than approximately 2 1/2 inches, the operation of this
28 configuration of an extended cutting surface rotating at high speed and
29 fully exposed, may be dangerous to the user and to the work piece, in
30 this case the mouth of a horse. The mouth of a horse is deep and

1 requires a tool of at least 12 inches in length to adequately reach the
2 exposed surface of the back molars.

3 GUARD (Safety shield/hand piece) AND ROTORY TOOL
4 SUPPORT (with vacuum channel)

5 A guard in the form of an encircling shield may be installed
6 around the tool's shaft and cutting surface to separate the user and
7 portions of the horse's mouth from the tool which is in rotary motion.
8 The guard should be fabricated to have a minimal opening to allow only
9 a selected portion of the cutting surface to be exposed. The hand piece,
10 mountable on the end of the motor or flexible shaft, may be fabricated to
11 incorporate the guard in a manner that allows the tool to be mounted
12 within a channel of the hand piece thereby supporting the shaft and
13 encircling the cutting surface. Support of the shaft is generally required
14 if the shaft of the tool is longer than approximately 4 inches in order to
15 reach into all areas of the mouth of the horse, pressing the cutting
16 surface onto the surface of the tooth may move the shaft and or cutting
17 surface against the safety shield or channel of the handpiece. Bearings
18 may be mounted at preselected positions along the channel to support
19 and protect the rotating shaft and cutting surface under conditions of
20 engaging the channel or guard surfaces.

21 The hand piece may be supplied as a set of selected lengths
22 specially adapted to service a selected portion of the horse's mouth. A 6
23 to 8 inch hand piece may be used to service the incisors. A 12 to 14
24 inch handpiece may be used for the back molars. An 8 to 12 hand piece
25 may be supplied for intermediate service whereas a 10-inch hand piece
26 is the recommended length for an all around arrangement.

27 The hand piece may include a second channel partially
28 separate from the rotary tool channel. The hand piece may be
29 fabricated to form an orifice near the cutting surface whereby the orifice
30 is in communication with the second channel. The end of the second

1 channel remote from the cutting surface is attachable to a vacuum
2 source such as a "SHOP VAC" ® whereby tooth material removed by the
3 cutting surface may be sucked out of the mouth of the horse along the
4 second channel without having to remove the hand piece from the
5 mouth of the horse.

6 The hand piece may also incorporate appropriate gearing
7 and joints to transpose the rotary motion of the motor and apply a
8 reciprocating motion to the tool mounted on hand piece. The
9 reciprocating tool usually contains a textured surface to remove tooth
10 material especially from the rear most molars which so abuts the gum of
11 the horse that the use of a rotating tool even with a guard may cause
12 injury to the gum.

13 In the preferred embodiment, the incorporation of an
14 adjustable clutch within the power train, mounting of at least one
15 support bearing within the handpiece, mounting the rotary tool with a
16 guard and further providing for the mounting of shaped guard
17 extensions on the surface of the guard provides a quick reconfiguration
18 of the arrangement during the procedure that provides care and
19 maintenance for the entire set of teeth.

20 An adapter may be provided to allow the user to use at least
21 a portion of the arrangement such as the tool handpiece and guard
22 system with a power dental device already owned by the user.

23 BRIEF DESCRIPTION OF THE DRAWINGS

24 The above and other embodiments of the present invention
25 may be more fully understood from the following detailed description,
26 taken together with the accompanying drawings, wherein similar
27 reference characters refer to similar elements throughout, and in which:

28 Figure 1 A, B, C, D and E are front views of the present
29 invention;

30 Figure 2 is a front view of a bearing support;

1 Figure 3 is a front view of another bearing support;
2 Figure 4 A, B, C, and D are views and a cross section of the
3 present invention;
4 Figure 5 A, B, and C are views of another embodiment of the
5 present invention;
6 Figure 6 B and F are views of another embodiment of the
7 present invention, Figure 6 H is a view of the hose;
8 Figure 7 B and F are views of a flange;
9 Figure 8 is a cross sectional view of the present invention;
10 Figure 9 is a cross sectional view of the present invention;
11 Figure 10 is a front view of the bearing support;
12 Figures 11 and 11F are a view of another embodiment of the
13 present invention, Figure 11 E is a view of the extended shaft;
14 Figure 12 X, Y and Z and A, B, C are views of another
15 embodiment of the present invention ;
16 Figure 13 is a view of an attachable handle;
17 Figure 14 is a view of another embodiment of the present
18 invention;
19 Figure 15 is a detailed view of another embodiment of the
20 present invention;
21 Figure 16 is a schematic of the power train; and,
22 Figure 17 is a view of the clutch arrangement.

23 DESCRIPTION OF A PREFERRED EMBODIMENT

24 Referring now to the drawing, there is illustrated in Figures
25 1A through 1E an embodiment of an arrangement fabricated according
26 to the teaching of the present invention and generally designated 10.
27 Figure 1A illustrates a rotary tool support generally designated 301
28 mountable within a hand piece generally designated 401. The hand
29 piece 401 is fabricated to form a guard around a selected portion of the
30 cutting surface 302. This embodiment is adapted to be attachable to a

1 motor directly or by means of a flexible shaft and/or a handle that the
2 user may own.

3 The rotary tool support 301 illustrated in Figure 1A is
4 fabricated to support the shaft 303 of the rotary tool with a cutting
5 surface 302 mounted on the shaft 303, even if a long shaft 303 (greater
6 than 6 inches) is used.

7 Now referring to Figure 1C, the hand piece 401 fabricated
8 according to the principals of the present invention incorporates the
9 base 403 which may be fabricated to adapt the arrangement to a
10 powered rotating source, such as a flexible shaft which is engageable with
11 the shaft 303, or be mountable directly on the end of a powered rotating
12 source already owned by the user. The end of the hand piece 401
13 remote from the powered rotating source is fabricated as a guard
14 encircling a selected portion of the cutting surface 302 and may accept
15 the mounting of an extended guard 406. The long shaft 303 of the
16 rotary tool is required so that the arrangement may be used to reach
17 even the rear most teeth within the mouth of the horse. The shape of
18 the extended guard 406 may be selected to protect a particular portion of
19 the horse's mouth and thus may form a set of removable attachable
20 guards.

21 Now referring to Figure 1 A, there is illustrated a rotary tool
22 support generally designated 301. The rotary tool mounted with the
23 support 301 has a cutting surface 302 mounted on a shaft 303, this
24 illustrated combination is commonly known as a burr. The shaft 303
25 extends along a bearing support sleeve 304. In the preferred
26 embodiment, a bearing 305 is press fit into the end of the sleeve 304
27 nearest the cutting surface 302. An upper shaft seal 306 is mounted
28 above the bearing 305. A lower shaft seal 307 may be mounted on the
29 end of the shaft 303 remote from the cutting surface 302 to protect the

1 bearing 305 from contamination. Figure 1 B shows the rotary tool
2 support 301 fully assembled.

3 Figure 1 C illustrates a hand piece generally designated 401.
4 An outer shell fabricated of a capped tube 402 is mounted into an
5 adaptive base 403 having a plurality of setscrews 405 depicted as an
6 upper pair 405U and a lower pair 405L. The diameter of the tube 402 is
7 selected to be a snug fit for the fully assembled rotary tool support 301
8 but allow the tool support 301 to be easily inserted into or removed from
9 the tube 402. A selected upper portion of the tube 402 is removed down
10 to the lower edge 404 to form an opening and expose a selected portion
11 of the cutting surface 302. The remainder of the outer shell capped tube
12 402 forms a shield around the cutting surface 302. If more protection is
13 desired an external guard 406 of preselected shape may be slid over the
14 end of the tube 402 and secured in place with a set screw 405. The
15 shape of the external guard 406 is selected so as to not come into
16 contact with the cutting surface 302. Walls 407 form an opening in the
17 external guard 406 to expose a preselected portion of the cutting surface
18 302.

19 Figure 1 D illustrates the rotary tool support 301 fully
20 inserted into the hand piece 401 and secured lightly therein by the
21 upper pair of setscrews 405U. The end of the shaft 303 remote from the
22 cutting surface 302 is mounted into the collet 202. In this embodiment,
23 the collet 202 is mounted on the end of a flexible shaft handle 203,
24 which may be mounted to a motor. The adaptive base 403 is installed
25 over the flexible shaft handle 203 and tightly secured in place by the
26 lower pair of setscrews 405L followed by tightening the upper pair of set
27 screws 405U. Figure 1 E shows the exposed portion of the cutting
28 surface 302 surrounded by the hand piece 401 and external guard 406
29 fully assembled.

1 The external guard 406 may be fabricated with second wall
2 409 forming an intake orifice 410 at a preselected position near the
3 cutting surface 302. A vacuum channel 408, which in the preferred
4 embodiment is a hollow tube, may be mounted or fabricated within the
5 external guard 406, positioned essentially parallel to the handpiece 401
6 and in communication with the orifice 410. As the channel 408 has one
7 end making a connection with the intake orifice 401 formed by second
8 wall 409, the channel 408 provides an open passage way for sucking out
9 dust and debris created during use of the cutting surface 302 upon the
10 condition of a vacuum source attached to the end of channel 408 remote
11 from the intake orifice 410.

12 In Figure 2 there is illustrated another embodiment of the
13 rotary tool support 301 fabricated as above with the addition of a lower
14 bearing 308 mounted within the bearing support sleeve 304 above the
15 lower shaft seal 307. However, when the shaft 303 in such a multiple
16 bearing arrangement is mounted within the collet 202 of the flexible
17 shaft handle 203, should the flexible shaft handle 203 also be fabricated
18 with a multiple bearing arrangement, a misalignment of the bearings of
19 the flexible shaft handle 203 and the bearings supporting shaft 303 may
20 occur to cause excessive wear on one or more of the bearings or may
21 cause the arrangement to bind and not be smoothly rotatable by the
22 motor. This binding may be overcome by providing a means to adjust
23 the alignment of the bearings.

24 If the lower bearing 308 and external seal 307 are removed
25 to overcome any binding problem then another problem may develop.
26 During use of the arrangement, the end of the bearing support sleeve
27 304 remote from the cutting surface 302 may come into contact with the
28 collet 202 causing excessive wear to the point that the collet 202 cannot
29 be loosened for the removal of the shaft 303.

1 Figure 3 illustrates a solution. The use of a lower bearing
2 308 and lower seal 307 can be eliminated and damage to the collet 202
3 be avoided by mounting a hollow brass tube 309 onto the shaft 303.
4 Upon the mounting of the shaft 303 into the collet 202, the end of the
5 brass tube 309 may be positioned to be spaced apart from the collet 202
6 or in contact with the collet 202. However the end of the sleeve 304
7 should not be in contact with the collet 202. The brass tube 309
8 extends from below the upper bearing 305 to a selected distance, 1/16
9 to 1/8 inch, below the end of the bearing support sleeve 304 remote
10 from the upper bearing 305. Upon use of this arrangement, the brass
11 tube 309 performs the function of a bearing by allowing the remote end
12 of the sleeve 304 to come into contact with the brass tube 309 but the
13 brass tube 309 keeps the sleeve 304 separate and apart from the
14 rotating shaft 303.

15 Figure 4 illustrates a specialized handpiece 402 fabricated
16 according to the teachings of this invention to incorporate a first channel
17 for the support for the shaft 303 of the selected rotating tool, a guard
18 partially encircling the tool mounted on the shaft and a second channel
19 which may be attached to a vacuum source. This arrangement generally
20 designated 401 and is fabricated to directly attach to a preferred motor
21 by means of a flexible shaft. The rotating tool illustrated as mounted in
22 the handpiece 402 is a diamond cutoff disk 310 mounted on the end of
23 shaft 303. In the preferred embodiment, the center of the disk is welded
24 to the shaft rather than attached to a shaft by a screw or bolt. This
25 arrangement creates a flat surface on the topside of the disk and is
26 preferred for polishing, as it does not have any high points. The disk
27 310 may be used in this arrangement to slice off a portion of a tooth
28 rather than grind off the portion with a cutting surface known as a burr.
29 The partial cutaway view in Figure 4 B illustrates the end of the shaft
30 303 remote from the disk 310 to be removably insertable within the

1 bearing support sleeve 304 through the bearing 305. The shaft 303
2 may be further protected by a hollow brass tube 309. A connector 311
3 attaches the end of the shaft 303 remote from the disk 310 to an adapter
4 312 which is adapted to slip directly into the end of a motor driven
5 flexible shaft that compatible with the selected motor obtained under the
6 trademark SUHNER. Another preselected shaped adapter 312 may be
7 mounted to the connector 311 to facilitate easy connection to a flexible
8 shaft compatible with the DREMME[®] motor. A latch 413 may be
9 mounted on the handpiece 402 engagable with a catch formed on the
10 end of the flexible shaft to hold the end of the flexible shaft within the
11 hand piece 402. The illustrated hand piece 402 may be re-configured by
12 replacing the cut-off disk 310 with a selected burr (cone, cylinder or ball)
13 and used for care and maintenance, particularly in the front portions of
14 the horse's mouth.

15 A flange 411 may be added to the hand piece 402 to provide
16 room for a second channel that functions as a vacuum channel 408.
17 This second channel is fabricated within the handpiece 402 and flange
18 411. An orifice 410 of a preselected shape may be fabricated in the
19 handpiece 402 near the cutting surface of the rotating tool 310. The
20 vacuum channel 408 is fabricated to have one end in communication
21 with the orifice 410 and the other end adapted to be connected to a
22 vacuum source. The vacuum channel 408 provides a hollow pathway
23 starting from the orifice 410 for the removal of debris through the second
24 channel upon connection to a vacuum source. Some segment of the
25 second channel for the vacuum path and the first channel for the shaft
26 within the shaft support may be in common before being bifurcated.
27 Figure 4 D depicts how the flange 411 is held within the handpiece 402
28 with a snug fitting tongue and groove arrangement 412 and kept in place
29 by a set screw 405. In the preferred embodiment the snug fit eliminates

1 the need for a gasket to maintain sufficient vacuum differential to suck
2 out dust and debris.

3 Figure 5 A, B and C depicts a hand piece generally
4 designated 401 fabricated according to the teachings of this invention.
5 The arrangement illustrated in Fig. 5 A, B and C is shaped and sized for
6 maintenance of the incisor teeth of the horse. The exposed portion of the
7 cutting surface 302 is minimized by fabricating the outer capped top 402
8 of the handpiece 401 to be close fitting and encircling a large portion of
9 the cutting surface 302. This minimizes the opportunity for the fleshy
10 parts of the horse's mouth to become entangled between the cutting
11 surface 302 and the handpiece 401. The edges 414 of the hand piece
12 401 below the cutting surface 303 are shaped to provide a smooth
13 slightly curved surface that slips smoothly over the teeth and allows the
14 exposed cutting surface to be forcibly pressed against the selected area
15 of the tooth with minimal, non-interfering contact of the hand piece 401
16 with the teeth.

17 The close fitting of the cutting surface to the handpiece 401
18 is achieved in the preferred embodiment by fabricating the base 415 of
19 the handpiece 401 as illustrated in Figures 6 F and 6 B. In the preferred
20 embodiment, the base 415 is machined of aluminum bar stock to form a
21 rounded cap 416 on one end and access channel 417 open on the other
22 end. Wall 407 is shaped to form an encircling guard around a portion of
23 the cutting surface thereby exposing only a selected portion of the
24 cutting surface near the rounded cap 416. Wall 407 extends away from
25 the rounded cap 416 and toward the access channel 417 to form a first
26 channel for the shaft 303 mounted within the shaft support sleeve 304
27 as illustrated in Fig 10. This shaft channel is bifurcated below the
28 exposed cutting surface to communicate with a second channel 408,
29 which is part of the vacuum path. Second wall 409 forms an orifice 410

1 near the cutting surface. A flange mount 418 is formed as shown in
2 Fig. 6 B as a grooved opening wherein the flange 411 may be mounted.
3 The flange 411 illustrated in Figures 7 F and 7 B is a support for a
4 hollow tube 420 one end of the tube 420 communicating with the
5 vacuum channel 408 and the other end extending beyond the flange 411
6 and attachable to a vacuum source. The edges 419 formed around the
7 periphery of the flange 411 are shaped as a tongue surface engagable
8 with the groove formed in the periphery of the flange mount 418 making
9 a snug fitting tongue and groove arrangement 412, snug enough to
10 prevent dissipation of the vacuum pressure so as to not decrease the
11 suction of dust and debris from inside the mouth of the horse passing
12 along the path from the orifice 410 through the vacuum channel 408
13 and hollow tube 420 to the vacuum source, a SHOP VAC ® with
14 appropriate hoses 431 similar to that illustrated in Figure 6 H. The
15 vacuum hoses 431 which join the end of the hollow tube 420 to the
16 vacuum source may be tied to the powered flexible shaft so that as the
17 user moves the hand piece, the line providing the rotational power and
18 the line providing the vacuum source move with the hand piece as a
19 unit.

20 A latch 413 may be mounted in the base 415 at a position to
21 engage a catch mounted on the flexible shaft to secure the flexible shaft
22 with the base 415.

23 Figure 8 is a cross section of the base 415 with flange 411
24 mounted therein by the tongue and groove 412.

25 Figure 9 is a cross section of the base 415 with flange 411
26 installed. A third wall forms a bearing support channel 421 starting
27 near this position and extending in the direction of the rounded cap 416
28 until it intersects with wall 407.

29 Figure 10 illustrates a bearing support sleeve 304 with a
30 bearing 305 and upper shaft seal 306 mounted within one end.

1 To assemble the arrangement, a selected tool comprised of a
2 cutting surface 302 and shaft 303 is inserted through the base 415
3 starting at guard 407 and then into the bearing support channel 421.
4 The bearing support sleeve 304 is then inserted into the bearing support
5 channel 421 engaging the shaft 303 through the bearing 305 so that the
6 shaft 303 extends beyond the end of the bearing support sleeve 304
7 remote from the bearing. The bearing support sleeve 304 is secured in
8 place within the bearing support channel 421 by setscrews 405. Now
9 referring to Figure 5 C, a connector 311 being first mounted to an
10 adapter to a flexible shaft 312, is mounted on the extended end of the
11 shaft 303. The adapter 312 being secured in place by a setscrew 405.

12 Figure 11F illustrates the base 415 of an extended
13 arrangement sized for reaching the rear molars inside the horse's mouth
14 and fabricated according to the teaching of the invention. In the
15 preferred arrangement, the base 415 is 14 inches long. This additional
16 length requires the shaft 303 attached to the cutting surface 302, the
17 bearing support sleeve 304, flange 411, and hollow tube 420 illustrated
18 in Fig. 11, to also be proportionally longer. These items may be extended
19 as illustrated in Figure 11 E. A connector 311 attaches shaft extension
20 313 to the shaft 303 of the cone shaped cutting surface 302.

21 An additional setscrew 405 may be used to secure the longer
22 bearing support sleeve 304. The orifice 410 formed by wall 409 at the
23 front end of the vacuum channel 408 remains similar as it is sized in
24 relationship to the cutting surface 302.

25 Figures 12 X, Y and Z illustrate the assembled extended
26 arrangement having a base 415 approximately 14 inches long supporting
27 a rotary tool having a cutting surface 302 and shaft 303 mounted within
28 a bearing support sleeve 304. A connector 311 with adapter to flexible
29 shaft 312 is mounted on the end of the shaft 303 remote from the
30 cutting surface 302.

1 Because the back of the horse mouth is surrounded by
2 fleshy material, the rounded cap 416 of the base 415 may provide
3 inadequate separation between the cutting surface 302 and the fleshy
4 material. An external guard 406 may be mounted on the base 415 to
5 enhance the separation of the fleshy material from the cutting surface
6 302. Posts 422 are mounted near the cutting surface 302. Figures 12
7 A, B and C illustrate three shapes, left, right and balanced , respectively
8 of a type of extended guard 406 which may be removably attached to the
9 base 415 to provide extra separation between the fleshy material and the
10 cutting surface 302. Each extended guard 406 is fabricated with walls
11 423 forming holes engagable with the posts 422. Wall 424 forms an
12 opening to expose the cutting surface 302 and wall 425 forms an
13 opening communicating with the orifice 410. Wall 426 forms a shallow
14 channel in the base 415 into which the lower edge 427 of the extended
15 guard 406 may be inserted. Wall 431 forms a retaining hole in each
16 side of the base 415. A wedge arrangement 428 having an offset head
17 429 and a pin 430 is insertably removable by pin 430 into a selected
18 retaining hole 431 whereby the wedge arrangement 428 is rotated by
19 handle 432 to a position wedging the extended guard 406 securely into
20 place by means of the offset head 429.

21 An attachable handle generally designated 501 is illustrated
22 by Figure 13. This handle may be mounted on the remote end of the 14
23 inch base 415 like a pistol grip to provide a leveraged advantage
24 especially for inserting and guiding the extended arrangement assembled
25 to the rear molars for removing tooth material. This handle incorporates
26 a clamp 502 removably mountable over the end of the base 415 to a
27 position remote from the cap 416. Walls 503 form a threaded hole in the
28 clamp 502 that accepts an extended screw 504 which upon being
29 threaded into threaded hole 503 secures the handle 501 in place as well
30 as preventing movement of clamp 502.

1 Other arrangements that are especially useful for the care of
2 the rear molars is illustrated in Figure 15, the base 415 providing
3 support for the shaft 303 within bearing support sleeve 304, all similar
4 to the above embodiments but a set of gears 428 are mounted on the
5 shaft 303 to change the profile of the shaft 303 by ninety degrees. This
6 embodiment is particularly useful with the cut-off disk 310 mounted
7 therein in a position which is essentially horizontal. The cut-off disk can
8 be easily positioned to score a portion of a tooth to be chipped off or used
9 to polish and smooth selected teeth even in the rear portions of the
10 horse's mouth.

11 The arrangement illustrated in Figure 14 is fabricated
12 according to the above teaching but incorporates a set of gears 429
13 mounted within the base 415. The gears 429 are adapted to change the
14 rotational motion of the shaft 303 to a reciprocating motion. In the
15 preferred embodiment, the reciprocating motion is approximately 1/4
16 inch back and forth. A tool pad 453 is removably attachable to a
17 reciprocating tool handle. The tool pad 453 has a flat cutting surface
18 and is particularly useful for the care and maintenance of the rear most
19 molars in the horse's mouth. The hand piece 415 may be pistol shaped
20 to supply leverage and to provide adequate mounting for the set of gears
21 428 within the hand piece 415 at a point that is not inserted into the
22 mouth of the horse.

23 The units in the preferred embodiment are fabricated of a
24 preselected material such as aluminum, chosen to be lightweight,
25 strong, easily machined and able to function in a wet environment. The
26 surface of the aluminum may be anodized to protect the material from
27 corrosion. A lightweight urethane material is preferred for the slip on
28 extended guard 406 shown in Figure 1 C.

29 Figure 16 is a schematic representation of the power train
30 generally designated 201. The basic configuration is a selected motor

1 101. The tools may be mounted directly onto the shaft of the motor 101
2 or separated from the motor 101 by a flexible shaft 204 as discussed
3 above. Both configurations provide a direct connection between the
4 motor 101 and the cutting surface 302 of the tool. In the preferred
5 embodiment of the power train 201, an adjustable torque clutch 206 is
6 included. Should the preselected torque of the clutch 206 be exceeded
7 during use of the arrangement fabricated according to the teachings of
8 this invention, the clutch 206 will disengage the powered motion of the
9 motor 101 from the tool thereby minimizing possible injury to the horse
10 or user and allow the user to safely clear any obstruction of the
11 arrangement before continuing use.

12 Figure 17 illustrates a clutch 206 having a set of clutch
13 plates 207, a torque adjustment knob 208 that sets the tension between
14 the clutch plates 207. An end adapter 209 compatible with the flexible
15 shaft 204 is mounted on the clutch 206 remote from the motor 101. The
16 clutch 206 is mounted within the collet 202 of the motor 101.

17 A clutch housing 210 is fabricated to slip over the clutch
18 206 and onto the motor 101 to a position whereby the end adapter 209
19 is engagable by the end of the flexible shaft 204 which is mounted within
20 the clutch housing 210. A sliding window 211 may be mounted on the
21 clutch housing 210 to allow easy access by the user to the torque
22 adjustment knob 208.

23 Figure 16 illustrates a collar 212 fabricated from stainless
24 steel and mounted on the flexible shaft 204 remote from the end of the
25 flexible shaft mounted to the clutch housing 210. The collar 212 is
26 fabricated with a catch 213 engagable by the latch 413 mounted on the
27 base 415 of the hand piece 401 when the collar 212 is inserted within
28 access channel 417. The rotational motion of the motor 101 is
29 selectively, interruptably transmitted to the clutch 206, through the

1 flexible shaft 204 engagable with the flexible shaft adapter 312 to the
2 cutting surface 302.

3 Since certain change may be made in the above apparatus
4 without departing from the scope of the invention herein involved, it is
5 intended that all matter contained in the above description, as shown in
6 the accompanying drawing, shall be interpreted in an illustrative, and
7 not a limiting sense.